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average weight of the Brain in different races of Mankind," by Jos. Barnard Davis, reported in favor of its publication in the Journal.

On favorable report of the Committees, the following papers were ordered to be published:

**A Review of the species of the PLETHODONTIDÆ and DESMOGNATHIDÆ.**

BY E. D. COPE, A. M.

Family PLETHODONTIDÆ.

Gray Catalogue Batrachia Gradienia Brit. Mus. 1850, 31. Exclusive of the Amblystoma and Desmognathus.

Plethodontidæ Cope, Journ. Ac. Nat. Sci. Phil., 1866, 105.

Spelerpinæ Cope, Proc. Ac. Nat. Sci. Phila. 1859, 123.

Plethodontidæ, Bolitoglossidæ and Hemidactyliidæ, Hallowell, Journ. Ac. N. Sci. Phil., 1858, 338, 339.

No anterior axial bone; palatines not prolonged over parasphenoid; bearing teeth on the posterior portion. No postorbital arch.

Dentigerous plates on the parasphenoid.

Carpus and tarsus cartilaginous.

Vertebræ amphicælian.

Occipital condyles sessile.

Prefrontals present, pterygoids wanting.

Prefrontals not prolonged or embracing frontals; parietals slightly embracing.

Orbitosphenoids separated by membrane from proötic.

Vestibule, inner wall osseous.

The preceding diagnosis includes the characters assigned to the family by the writer in 1866, excepting one, i.e. the presence of the premaxillary fontanelle, which I find to be wanting in the genus *Stereochila* m.

In the characters of the scapular and pelvic arches this family does not differ from the Amblystomidæ and Salamandridæ. The foramen which separates the coracoid from the procoracoid is well marked and intermarginal; in the Amblystomidæ it is smaller, and in the Salamandridæ marginal. The femur always presents a strong trochanter; it is weak in *Stereochila marginata*. In *Hemisalamandra* and *Diemyctylus* it is quite weak, but in *Salamandra* strong.

In most of the genera of this family the enamel does not cover the entire crown of the tooth. In *Spelerpes rubra*, *longicauda* and *bellii*, and *Plethodon glutinosus* and *cinereus*, the external part of the crown terminates in a transverse cutting edge, while the inner extremity is more prolonged, leaving a transverse depression between the two. In *Sp. bellii*, the inner apex is transverse and prolonged a little beyond the external, while in the other *Spelerpes* and the *Plethodon glutinosus* the inner crown is more prolonged and incurved conic. In *P. erythronotus* it is a little more obtuse. In *Desmognathus* and the Amblystomidæ the two apices are of equal height, and are both transverse cutting edges, the outer narrowed in the former. In the larvæ of Plethodontidæ that I have examined, the crowns are more simple. The teeth of *Anaides* are more like those of the *Coecilia* or of *Hylonomus* of the coal measures, and distinguish the genus from other Plethodontidæ.\*

This family is more remote in its skeletal characters from the Salamandridæ and Pleurodelidæ, than is the Amblystomidæ. Thus the absence of parasphenoid brushes, the ossification of the tarsus and carpus, and the persistence of the pterygoid bones are characters common to the two latter, and wanting in

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\*See Proceed. Acad. N. Sci. Phila., 1859, 124.

the present family. On the other hand, the non-prolongation posteriorly of the vomers, and the amphiœlian vertebræ, belong to this family and the Amblystomidæ only. The position of the latter family is therefore between the Plethodontidæ and the Salamandridæ. The Amblystomidæ and Plethodontidæ may be thus compared with reference to the developmental character of the features which distinguish them.

AMBLYSTOMIDÆ.

Superior.

Carpus and tarsus osseous.

Premaxillary fontanelle closed.

Inferior.

O. pterygoideum persistent.

PLETHODONTIDÆ.

Inferior.

Carpus and tarsus cartilaginous.

Premaxillary fontanelle open.

Superior.

O. pterygoideum obliterated.

The inferiority of some Plethodontidæ is seen in the non-distinction of the digits (Geotriton), the thinness of the ossification of the parietal membrane bones (Batrachoseps), and in *Opheobatrachus lineolus* m, from Vera Cruz, the persistence of the membranous cranium by the limitation of the parietal bones to two small lateral scales, and the wide divarication of the posterior extremities of the frontals.

Most characters of this family are those of low development, and approximations to the larval condition, except the loss of the pterygoid; two of the species exhibit a subocular cirrus, which occurs in some of the Gymnophidia (*Cœcilia*) and *Dactylethra* among *Anura*. It is probably the persistence of that long subocular tentacle characteristic of the early larval stage of *Salamandridæ* and *Pleurodelidæ* (e. g., *Salamandra Notophthalmus*), and of a later larval stage of *Dactylethra* (vid. Wyman and Gray), where they resemble the appendages of the *Siluridæ*. They have been called crochets by Rusconi, and homologized with the cylindric cephalic processes of the larval *Rana*, with what correctness remains to be proven by observations on other types.

Eschscholtz correctly represents *Batrachoseps attenuatus* as without prefrontals. An elongate process of the frontal occupies only part of its place, forming no suture with the maxillary; this is quite different from *Desmognathus*, where the orbit is completed by the union of frontal and maxillary. In *Batrachoseps quadridigitatus* the prefrontal occupies this depression as an elongate vertical scale.

In *Spelerpes rubra* the quadratum presents a small internal anterior ala, which has a superficial resemblance to a pterygoid. In this species there is apparently an azygos bone behind the premaxillaries; this is, however, only the exposed extremity of their united spines, which are nearly or quite isolated by the approximation of the anterior parts of the nasale. It does not occur in the *Gyrinophilus salmoneus*.

The genera embraced in this family appear to be as follows:

Section I. The tongue attached from the central or posterior pedicel to the anterior margin in narrower or wider band. (Plethodontæ).

A. Two premaxillary bones.

Digits 4—5; maxillary bone regular, with numerous small teeth; parietals fully ossified..... PLETHODON.

Digits 4—4; maxillary as above, parietals fully ossified. HEMIDACTYLUM.

AA. One premaxillary.

a. Digits 4—4.

Maxillary regular, with small teeth; parietals not ossified.. BATRACHOSEPS.

aa. Digits 4—5.

Maxillary normal, teeth small, very numerous; no premaxillary fontanelle.

STEREOCHILA.

Maxillary edentulous posteriorly, decurved, forming a cutting edge; teeth few, large, knife-shaped; a premaxillary fontanelle..... ANAIDES.

[May,

Section II. The tongue free all around, attached by its central pedicel only. (Spelerpes).

A. Two premaxillary bones (with fontanelle).

Digits 4—5, closely united by a broad palmar membrane..... GEOTRITON.

Digits 4—5, entirely free..... GYRINOPHILUS.

AA. One premaxillary bone (with fontanelle).

a. Digits 4—4.

Digits free, parietal and palatine bones well ossified..... MANCULUS.

aa. Digits 4—5.

Digits little distinct; parietal cartilages not ossified; two patches on parasphenoid teeth..... OPHEOBATRACHUS.

Digits entirely confounded as an undivided palm or sole; cranial bones well ossified..... EDIPUS.

Digits all free, cranial bones well ossified..... SPELERPES.

The generic relationships of the above named groups are exceedingly simple, and the ease with which the animals can be analysed, renders the case clear from the doubts which constantly arise in discussions of generic relationships as to the probable omission of characters from the argument. Here it can be safely asserted that, as far as the skeletons are concerned, there exist no other generic distinctions than those given above. If now any principles can be derived from consideration of the osseous system, that which of all others presents us with by far the greatest number of minute modifications of structure, the same may be with considerable probability inferred for the other systems.

The primary groups are distinguished by the different degrees of attachment of the tongue. That form which is most attached, represents, and is identical with, an immature stage of the species of Sect. second, where it is more extensively free, as any one may satisfy himself by the examination of a larva of Spelerpes at a certain period. The tongue will be found to be that of Plethodon.

The secondary groups are distinguished by the separation or confluence of the premaxillary bones. Those presenting the latter type exhibit separate premaxillaries during the early portion of larval life, though the union often takes place very early. The number of digits distinguishes groups of genera of less value; in some the hind limb has five digits, in others four. In an early larval stage all possess but four digits, and in some of those with five the inner consists of one phalange only, even at maturity, (Spelerpes *chiropterus*, et aff.), not having as complete a series of larvæ of Spelerpes and Plethodon, as of *Amblystoma punctatum*, the development of the digits in the latter will indicate the meaning of variations in the same at maturity. At a length of 1.2 mm. the fore limb only is projected, and bears two digits only, as in the genus *Proteus*. At 1.5 mm. sometimes the posterior limbs are developed, sometimes not; and from this size to 2.5 mm. the number of digits bears little relation to the size of the animal, an additional digit sometimes appearing earlier, sometimes later. Their numbers are then at first 2—0; then always 3—0; with the hind foot divided, they are 3—2, and then 3—3. Sometimes the anterior digits are complete in number before the hind limb appears, and we have combinations of numbers from 4—0 to 4—3, 4—4, and the full number 4—5, which is found in all specimens of 2.5 mm. and upwards. Genera which exhibit reduced digits are in *all* other respects Spelerpes (i. e. *Manculus*) or Plethodon (*Hemidactylum*) or *Hemidactylum* with unossified parietal bones and consolidated premaxillaries (*Batrachoseps*). Applying the case of *Amblystoma* to these, we could not assert that *Hemidactylum*, for instance, is *identical* with the undeveloped stage of Plethodon, since when *Amblystoma* exhibits digits 4—4, it is branchiferous. But making the more  
1869.]

legitimate comparison with *Plethodon* itself, I find that the complete number of posterior digits appears much later in life than in *Amblystoma*, that development in this regard is retarded, while in respect to the gills it is accelerated. Thus in *Plethodon erythronotus* the exterior digit is longer than the interior; in specimens of 2.4 mm. the outer digit is the shorter; in those of 1.8 mm. which are without gills, it is a very minute tubercle on the outer metatarsus. In a little earlier stage it cannot but be wanting, though this I have not seen, and I have little doubt that it is then a *Hemidactylum*, unless indeed the parietal bones be not ossified.

Another foetal condition rendered permanent is seen in the generic character of the genus *Ædipus*, which differs from *Spelerpes* solely in the foetal non-separation of the digits. In the larva of *Sp. rubra*, the digits are early entirely distinct, so that so far as this species is concerned *Ædipus* presents an *inexact parallelism*, but they are also more distinct than in the mature *Spelerpes bellii*, where, as might be supposed, the foetal union is delayed to maturity in other respects, as in a specimen from Orizava, Mex., of 16.5 l. in length. Here the union is about as extensive as in *Ædipus morio*. In the young of *Thorius pennatulus* the digits are not distinguished in specimens of .66, the full size, and otherwise entirely mature. In the adult they are distinct for half their length. The digits in the young larva of *Gyrinophilus salmoneus* are as distinct as in those of *Spelerpes rubra*; in one example I find the simple foot of earlier stages retained, resembling exactly that of *Ædipus*, excepting that there are emarginations for but three toes, instead of five. Genera which have no premaxillary fontanelle at maturity have it in the larval stage. Finally closely allied genera, which only differ in the degrees of ossification of the parietal and palatine bones, represent simply the relation between undeveloped and developed conditions of the same form.

The relations of the genera may be expressed as follows: Those of the first or *Plethodontine* section are related to those of the second or *Spelerpine*, by an *inexact parallelism*, excepting *Anaides*, whose peculiarities exclude it from the comparison. Those in each section differing in the union or separation of the premaxillary bones, are related in the same way to each other. The nearly allied genera in the *Plethodontine* group are *Hemidactylum* and *Plethodon*, and *Batrachoseps* and *Stereochila*. In the first case we have only *inexact parallelism*, because while *Plethodon* has the four digits of *Hemidactylum*, its parietal bones are unossified, though an acceleration of development in this respect would render the relation one of *exact parallelism*. This is apparently the relation between *Batrachoseps* and *Stereochilus*, for with the foetal digits of the latter, the former preserves also its foetal cranium. It only remains to ascertain whether *Stereochilus* loses its branchiæ before or after acquiring the normal number of digits. From the very small size of one at least of these, the former case seems probable, but I have not yet been able to prove it by direct observation. Should it be so, we would have a case of *exact parallelism*.

In the *Spelerpine* group the relation between *Geotriton* and *Gyrinophilus* is again one of *inexact parallelism*, since when the digits of the latter are only separated at the extremities, as in the former, the animal is still branchiferous and possesses the larval tongue, etc. The same occurs in *Spelerpes* when certain of its species present but four hind toes as in *Manculus*; therefore the relation of these two is also of *inexact parallelism*. The relation of *Opheobatrachus* is, however, one of *exact parallelism*, for its characters are all found in some young *Spelerpes* at an immature age, subsequent to the absorption of the branchiæ. With *Ædipus*, if the condition be not that of *exact parallelism* with some species of *Spelerpes*, the approach to it is close, as above observed. It is chiefly prevented by the fact that the ossification of the parietal bones in most species of the latter takes place after the extremities are fully developed. It is to be observed in this connection that, as has been above pointed out, the separation of the digits takes place at very different periods in the history of the different

[May,

species of the same genus. Thus in *Spelerpes rubra* they are entirely distinct at a very early period of larval life, while in *S. cephalicus* and *S. bellii*, which much more nearly resemble the species of *Ædipus* in the disposition of the vomerine teeth and cylindric form of the tail, this separation is much retarded.

These genera may be parallelized also in the following manner, in illustration of the law of heterology :\*

Plethodontæ.	A. one premaxillary. No fontanelle.	Spelerpeæ.
<i>Stereochila</i> .	A. fontanelle. Toes 4—5. Teeth large.	*      *
<i>Anaides</i> .	Teeth small.	*      *
*      *	Toes 4—4.	<i>Spelerpes</i> .
<i>Batrachoseps</i> .	AA. Two premaxillaries.	<i>Manculus</i> .
<i>Hemidactylium</i> .	Toes free.	<i>Gyrinophilus</i> .
<i>Plethodon</i> .	Toes united.	<i>Geotriton</i> .
*      *		

The minor relations may be more readily expressed thus :

Plethodontæ.	Digits 4—5.	Spelerpeæ.
<i>Plethodon</i> .	A. Digits distinct.	<i>Gyrinophilus</i> .
<i>Anaides</i> .	Two premax.	<i>Spelerpes</i> .
*      *	One premax.	
*      *	A. Digits united.	<i>Geotriton</i> .
	Two premax.	<i>Ædipus</i> .
	One premax.	
<i>Hemidactylium</i> .	Digits 4—4.	<i>Manculus</i> .
<i>Batrachoseps</i> .		
Or thus :		one premaxillary.
two premaxillaries ;	Digits 4—5.	
	α. distinct.	
<i>Gyrinophilus</i> .	Tongue free.	<i>Spelerpes</i> .
	Tongue attached.	
<i>Plethodon</i> .	αα. united.	<i>Stereochila</i> .
<i>Geotriton</i> .		<i>Ædipus</i> .
<i>Hemidactylium</i> .	Digits 4—4.	<i>Manculus</i> .
*      *		<i>Batrachoseps</i> .

The above genera present, within restricted limits, not only the relations which will be found to characterize genera elsewhere, but the relations between all natural groups of whatever rank, or in other words, between groups defined by structural peculiarities. From such simple cases we may derive the following rationale of classification with reference to characters above the specific : First,

\*See origin of Genera, p. 53.

those characters are highest which cover the greatest number of cases, (i. e. of species.) Second, the extent covered by each of a given number of characters being equal or nearly so, that is highest which expresses modifications of those characters which distinguish the group which embraces them all, from other groups of similar high rank. Third, the lowest grade of characters, except the specific, i. e. those which distinguish nearest allies, are always those which are assumed latest in the life history of each.

These rules are without significance if they do not point to a derivative hypothesis.

#### BATRACHOSEPS Bonap.

Tongue adherent anteriorly. Digits 4—4. A large parietal fontanelle. Premaxillary pierced by a fontanelle, single.

This genus embraces the forms which may be considered the lowest in the family, if *Necturus* be excluded. It differs from *Hemidactylium* nearly as *Opheobatrachus* does from *Spelerpes*, i. e., in the non-ossification of the parietal bones. This low grade of development is here seen in the extremities also, which are much reduced, and the snake-like form of one of the species. The species are three, as follows:

I. Costal plicæ 18; the toes well developed, palmate.

Outer posterior toe well developed; hind limb extending over 7.5 costal interspaces, fore limb to orbit; tail equal body and head to orbit, more slender than the body; belly yellowish.....*B. pacificus*.

II. Costal plicæ 20—1; toes very rudimental, little distinct.

Hind limb extending over six costal interspaces; fore limb nearly to orbit; tail as long as body and head to orbit; width of head seven times from muzzle to groin; belly black.....*B. nigriventris*.

Hind limb extending over four costal interspaces; fore limb not to angle of mouth; tail thick as body, as long as body and head plus the length from muzzle to axilla; width of head eight times from muzzle to groin; belly brown.

*B. attenuatus*.

#### BATRACHOSEPS NIGRIVENTRIS Cope.

This small species resembles the first in general proportions, but is nearer the next in the rudimental condition of the limbs.

Muzzle shorter than orbit; upper lip slightly angulated. A groove from the orbit posteriorly; a gular fold. Costal grooves extending to vertebral line, but not curved forwards there as in *H. scutatum*; extending across abdomen. Body slightly compressed. The tail as stout as the body at the base, subquadrate in section, becoming compressed at the tip, strongly annulate, not swollen. Inner digits on both feet minute. Vomerine series well developed; sphenoidals as in the others.

	Lines.
Total length.....	22
Do., exclusive of tail from vent. ....	13.5
Muzzle to axilla.....	3.5
Width head.....	1.7
Length fore limb.....	1.8
“ hind “ .....	2

Color above deep brown, separated abruptly from the black of the lower surfaces; tail black.

Two specimens of this species were brought to the Museum of Academy Natural Sciences from Ft. Tejon, California. One of these, Mus. Smithsonian, is No. 6734, 1 specimen, Ft. Tejon, Cal. 1865, Acad. Nat. Sciences. Geo. H. Horn, M. D.

#### BATRACHOSEPS ATTENUATUS Eschscholtz.

*Salamandra attenuata* Esch., Zoological Atlas, pt. v, pl. 21, figs 1—14. *Batrachoseps attenuata* Bonap., Fauna Italica, ii, 1841. Baird, Journ. Ac. Nat. Sci. Phil. i, 288. Gray, Cat. Brit. Mus. p. 41. Hallowell, J. A. Nat. Sci. Phil. 1858, 348.

[May,

**BATRACHOSEPS PACIFICUS** Cope.

*Hemidactylum pacificum* Cope, Proceed. Acad. Nat. Sciences, Phila. 1865, p. 195.

#### HEMIDACTYLIUM Tschudi.

Classif. der Batrachier Trans. Neuchatel, 1838, p. 54—94. Bonap., Fauna Ital. ii, 131, No. 10. Fitzinger, Syst. Rept. 33. Baird, Journ. Ac. Nat. Sci. Phila. i, 284, 1849. Hallowell, l. c. 1858, 365. Gray, Cat. Brit. Mus. 1850, 41. *Desmodactylus* Dum. Bibr. Erp. Gen. 8 p.

Tongue adherent anteriorly. Digits 4—4. Parietal bones fully ossified, without fontanelle. Two premaxillaries, with fontanelle.

This genus is only distinguished from *Plethodon* by the deficiency of its hind foot in digits. Those that remain are quite rudimental. There is but one species known, and its habits are entirely terrestrial.

**HEMIDACTYLIUM SCUTATUM** Schlegel.

*Salamandra scutata* Schlegel, Mus. Leyd. Abbildungen, t. 40, f. 4, 6, 1837. Fauna Japonica, ii, 119. *Hemidactylum scutatum* Tschudi l. c., Bonaparte l. c., Baird, Hallowell, Gray l. c. *Salamandra melanosticta* Gibbs, Bost. Journ. Nat. Hist. v, 89, t. 10. *Desmodactylus melanostictus* Dum., Bibr., viii. *Salamandra fusca* Green, Journ. A. N. Sci. Phil. i, 337, 1818, not *S. fusca* Raf.

#### PLETHODON Tschudi.

System d. Batrachier Trans. Neuchatel, 1838, 59—92. Bonap., Fauna Italica, ii, 131. Baird, Journ. Ac. N. Sci. Phil. i, 292. Hallowell, ib. 1858, 342. Cope, Proc. A. N. Sci. Phil. 1859, 124.

Tongue attached by the median line below, from the glossohyal bone to near the anterior margin; pterygoid teeth in two patches, more or less approximated; a large fontanelle between the spines of the separate premaxillary bones. Toes 4—5, normal. Anterior teeth not enlarged. Cranium well ossified. Two premaxillary bones, their spines embracing a fontanelle.

This genus is highly characteristic of the Regio Nearctica, where three species represent it on the Pacific slope, and two in the Eastern district. A species from Japan, named *P. persimilis* by Gray, is shown by Mivart not to belong to this genus.\* The species are all terrestrial in their habits, and three which I have observed (*P. oregonensis*, *P. glutinosus*, *P. erythronotus*) undergo their metamorphosis while quite small. The last named, and probably *P. glutinosus*, never enter the water, but are hatched in damp places on land. The branchiæ have therefore no functional service.

α. The pterygoid patches in contact throughout; vomerine series well separated medially.

Costal plicæ 16 to 19; form slender, tail cylindric, limbs weak, inner toes rudimental; vomerine series not extending beyond nares externally; belly brown marbled; above plumbeous or with a red longitudinal band.

*P. erythronotus*.

Costal plicæ 13; form slender, tail well compressed; limbs weak, inner toes rudimental; vomerine series not extending outside of nares; belly brown marbled; above with a red dorsal band.....*P. intermedius*.

Costal plicæ 14; form stout, tail rounded; limbs short, stout; inner digits distinct; vomerine series extending outside of inner nares; black, usually with gray lateral blotches and smaller dorsal spots.....*P. glutinosus*.

αα. The pterygoid patches well separated, vomerine series closely approximated medially.

\* Mivart calls it *Pectoglossa*, but gives no character by which it can be separated from *Amblystoma*.



Costal plicæ 13; form stout, head large, wide; lower jaw wider than upper; muzzle broadly truncate; tail slender subcylindric; black, limbs, belly, and spots of back, orange.....*P. croceater*.

Costal plicæ 10—11; form stout, head wide, maxillaries wider than mandible; muzzle narrowly truncate; tail slender, subcylindrical; light brown above; limbs and below yellow.....*P. oregonensis*.

**PLETHODON ERYTHRONOTUS** Green.

Var. *a. cinereus*.

Sal. c. (Sept. 1818) Green, J. A. N. S. i. 356.

P. c. (1838) Tsch., Class. der Bat. Baird, Journ. A. N. Sci. (2) 1 p.

Var. *β. erythronotus*.

Sal. e. (Sept. 1818) Green, J. A. N. S. i. 356. (1838) Holb. Herp. III. 13, pl. 27. (1842) 2d ed. v. 43, pl. 11. (1840) Storer, Mass. Rept. 245. (1842) Dekay, N. Y. Rept. 75, pl. 16, f. 38.

*Plethodon erythronotus* Baird l. c., Hallowell l. c., 1858, 343.

N.B.—Green quotes this species from Raf., whose description I cannot find.

Var. *γ. dorsalis*, Baird, M. S.

3776. Louisville, Ky.; Salem, Mass.

**PLETHODON INTERMEDIUS** Baird.

Proceedings Acad. Nat. Sci. Phila. 1857, 209.

Vancouver I.

**PLETHODON GLUTINOSUS** Green.

Sal. g. (Sept. 1818) Green, J. A. N. S. i. 357. (1838) Hol. Herp. 1st ed. ii, 129, pl. 30. (1842) 2d ed. v. 39, pl. 10?? (1849) Storer, Mass. Rept. 259, an. A. Jeffersoniana? (1842) Dekay N. Y. Rept. 81, pl. 17, f. 42 (very young).

Sal. variolata, (Dec. 1818) Gilliams, J. A. N. S. i. 460, p. 18, f. 1.

Sal. cylindracea, (Nov. 1825) Harl., J. A. N. S. v. 156.

*Triton porphyriticus*, (1842) Dekay, N. Y. Rept. 83, pl. 16, f. 37.

P. g. (1838) Tschudi, Class. der Bat.

Whole eastern district R. nearctica.

**PLETHODON OREGONENSIS** Girard.

*Heredia oregonensis* Girard, Proc. Acad. Nat. Sci. Phila. viii, 1856, 235. Girard, U. S. Expl. Ex. Herpet. 1858, 11. Hallowell, Pr. A. N. S. Phil. viii, 1856, 235.

*Plethodon ensatus* Cope, Proc. Acad. Nat. Sci. Phil. 1867, 167, e *Triton ensatus* Esch. = *Ensatina eschscholtzii* Gray = *Heredia oregonensis* Girard fide Mivart nec Eschscholtzii species!

Oregon, California.

**PLETHODON CROCEATER** Cope.

Proceed. Ac. Nat. Sci. Phil. 1857, p. 210.

Lower California.

**STEREOCHILUS** Cope.

*Char.* Tongue attached along the median line to the anterior margin. Pterygoid teeth in two elongate patches. Toes 4—5. Premaxillary bones confluent, with a simple spine, without fontanelle.

This genus is represented by but one species of the Eastern district of the Nearctic region. It is evidently of aquatic habits and is of larva-like proportions and appearance, but has the cranium fully developed, and in some respects more solidly than its allies. In the only skeleton I have examined, the prefrontal is present on one side and wanting on the other. The premaxillary bone is like that of *Desmognathus*, while the tongue is slightly freer than in *Plethodon*. The species exhibits weak extremities. It is from S. E. Georgia, and is quite rare.

[May,

Costal plicæ 17; elongate, head narrow, width more than seven times to groin, more than twice to axilla; no canthus rostralis; tail compressed from base, finned; small; pale yellow, brown lined.....*S. marginatum*.

*STEREOCHILUS MARGINATUS* Hallowell.

*Pseudotriton marginatus* Hallowell, Proceedings Ac. Nat. Sci. Phila. 1856, p. 130.

#### MANCULUS Cope.

Tongue free all round, boletoid. Toes 4—4. Parietal bones ossified, and without fontanelle. Premaxillaries co-ossified.

This genus only differs from *Spelerpes* in the absence of a digit from the hind foot, standing thus in the same relation to it that *Hemidactylum* does to *Plethodon*. Its only species was formerly referred to *Batrachoseps*, but besides the great difference in the tongue, the latter has a parietal fontanelle and lacks the prefrontal bone. The latter point is indicated by Eschscholtz in his Atlas. In the present genus that bone is present.

But one species is as yet known, which has a limited distribution. It is the smallest North American Salamander.

*MANCULUS QUADRIDIGITATUS* Holbrook.

*Salamandra quadridigitata* Holbrook, N. Amer. Herpetology, 2d ed. v, 65, tab. 21. *Batrachoseps quadridigitatus* Baird, J. A. N. Sci. Phila. 1842, p. 287; Gray, Catal. Brit. Museum, 1850; Hallowell, J. A. N. S. Phil. 1858, p. 348.

South East Georgia.

#### OPHEOBATRACHUS Gray.

Annals and Magazine Nat. Hist. 1868, p. 297. *Spelerpes* Spec. Cope, 1865. *Ædipina* Kieferstein, Archiv. fur Naturgeschichte, 1868, 299.

This genus differs from *Spelerpes* in the larval character of the cranium; its diagnosis is as follows:

Tongue free all round, boletoid. Digits 4—5, very short, distinct. Sphenoidal series of teeth not united. Cranium membranous above, parietal bones separated, scale-like. Internal nares enclosed except at the external fissure.

Gray gives the generic name to the *O. vermicularis*, on account of its remarkable vermiform shape. This is, however, among animals with reduced limbs, always a more or less variable character, and when constant in a species is certainly not of higher value. The relative elongation of the body and tail is a marked specific character in *Amblystoma*, *Plethodon* and *Spelerpes*, and in many Lacertilian genera, e. g. *Gerrhonotus*. It distinguishes species otherwise nearly identical, and in some cases, as in *G. multicarinatus*, mere varieties of the same species.

The species of this genus are very similar to those of *Spelerpes* in all respects; the difference is not quite the same as that between *Batrachoseps* and *Hemidactylum*. They are weak and of small size. The type species are distinguished by elongate tails. None are known outside of the Mexican zoological district, in the broad sense.

The generic characters were first indicated by the writer in the Journ. A. N. Sci. Phila. 1866, p. 100.

Costal plicæ fourteen.....*O. lineolus*.

Costal plicæ nineteen.....*O. vermicularis*.

*OPHEOBATRACHUS LINEOLUS* Cope,

*Spelerpes lineolus* Cope, Proc. Ac. Nat. Sci. Phil. 1865, 196.

*Char.* Fourteen costal plicæ; vomerine teeth in long series, extending behind internal nares; tail twice as long as head and body, cylindric. Three median toes, subequal.

Though the carpus and tarsus in this species are cartilaginous, the representation [1869.]

sentatives of the bones present in the osseous types (*Amblystoma* and others) are developed as they are in many other species of this family. The phalanges are 1—2—2—2—1 on the feet. The metatarsals are not fully ossified medially.

From Eastern Mexico.

*OPHEOBATRACHUS VERMICULARIS* Gray.

Annals and Magazine Nat. History, 1868, p. 297. *Cedipina uniformis* Keferst., Archiv. f. Naturgesch. 1868, 299.

I had formerly supposed this species to be the same as the preceding, till I read Dr. Keferstein's description, where the specific characters are for the first time pointed out.

Guatemala, Costa Rica.

#### GEOTRITON Gené.

Bonaparte, Fauna Italica, t. 31, No. 14.

Tongue attached by the glossohyal pedicel only. Two premaxillary bones, which embrace a fontanelle; parietals ossified, palatines well developed. Digits 4—5, united, extensively connected by membrane.

But one species of this genus is known, which is interesting as being the only species of the *Plethodontidae* which occurs in Europe. Its characters are quite identical with the *Cedipus* of the warmer parts of America, except in respect to the distinction of the two premaxillary bones, which are consolidated in *Cedipus*. Until I determined the existence of this character, I regarded the latter name as a synonyme of *Geotriton*.

a. Two phalanges, free.

Costal plicæ ten; head wide, width less than five times to groin; parasphenoid patches widely separated from vomerine teeth; pale brown above.

*G. fuscus*.

*GEOTRITON FUSCUS* Gesner.

*Salamandra fusca* Gesner. *S. savii* Gosse. *S. genei* Schlegel. *Geotriton genei* Tsch. *G. fusca* Bonap.  
Sardinia.

#### CEDIPUS Gray

Catal. Batr. Sal. Mus. Britt. 1850, 47, *num Tschudii, Bonapartii et aliorum?*

Tongue attached only at the glossohyal pedicel; digits 4—5, united by a broad dermal expansion, the phalanges little ossified. Premaxillary bones ankylosed and embracing a fontanelle. Parietal bones well ossified.

This genus is remarkably characterized by the structure of its feet, in which the digits, though possessed of the usual number of phalanges, are not ossified until and are not distinguished by the external division of the integuments. This, as is well known, is the condition of the extremities in one of the early stages of digit-bearing vertebrates, and in their number and proportions resemble especially fetal mammalia and Batrachia, at different periods of embryonic and larval life.

The species are found from Northern Mexico to the mountains of New Grenada.

a. One phalange free.

Body rather stout, head width a little more than five times in length to groin; thirteen costal folds; parasphenoid teeth approximating the vomerines; black, below paler with whitish specks.....*O. morio*.

αα. No phalanges free.

Body elongate, width of head more than six times in length to groin; costal plicæ thirteen; parasphenoid teeth in contact, and much produced anteriorly;

[May

black below, dorsal region yellow to orbits, with black spots; sometimes forming a median band.....*O. carbonarius*.

"Body short, stout; plicæ?; head width more than one-sixth length to groin; black, with pale specks, which may form series or not" (Peters).

*O. adpersus*.

Body short, stout; twelve costal plicæ; vomerine series commencing within inner nares; width of head less than five times in length to groin; black above; brown, white speckled below.....*O. rufescens*.

*ÆDIPUS MORIO* Cope.

*Geotriton carbonarius* (black variety) Cope, Proc. Ac. Nat. Sci. Phila. 1868, 313.

This species is near the *G. carbonarius*, and differs almost entirely in its free terminal phalanges, shorter body, and in coloration.

The muzzle is slightly truncate and the head flat, and not so wide as in *G. fuscus*; its width enters the length to the groin 5.33 times, indicating a shorter body than in *O. carbonarius*. The plicæ of the sides are, however, equal in number and well marked. Similar folds mark the sides of the tail. Those behind the eye are similar to those of *G. fuscus*, but less marked. The vomerine series are well arched, and nearly meet medially; they are nearly approached by the prolonged point of the parasphenoid patches, which together form a triangle, with the (posterior) basal angles rounded. The patches are separated by a groove for only about half their length. The distances between inner and outer nares are the same. The end of the muzzle projects beyond the mandible.

The limbs appressed leave two intercostal intervals between them. The inner toe is not free on either foot; one phalange of the others is free, except the median, where 1½ phalanges project. The free termination has a rounded thickening below.

Tail thickened, round, tapering.

*Color.* Black above; leaden black below; the under surfaces and lower parts of sides, with outer faces of limbs, speckled with indistinct whitish dots.

*Measurements. No.*

	Inches.
Length (axial) from end muzzle to orbit.....	.105
" " " canthus oris.....	.22
" " " axilla.....	.63
" " " groin.....	1.66
" " " end vent.....	1.94
" " " end tail.....	3.29
" fore limb.....	.45
" " foot.....	.145
" hind limb.....	.45
" " foot.....	.17
Width " " (sole).....	.17
" head.....	.28
" body.....	.28
" sacrum.....	.22

The only specimen I have seen is the following:

No. 6888, 1 specimen, Mountains of Guatemala, Dr. Van Patten.

*ÆDIPUS CARBONARIUS* Cope.

Proceed. Ac. Nat. Sci. Phila. 1860, p. 373.

? "*Salamandra platydactyla* Cuvier, Mus. Paris," not described.

? "*Ædipus platydactylus* Tschudi, Classif. der Batrachier, p. 93, 1838, not described.

*Bolitoglossa Mexicana* Dumeril, Erp. Gen. vol. ix, p. 93, 1854 (specimens from Vera Paz) pl. 105, fig. 1.

1869.]

**ÆDIPUS ADSPERSUS** Peters.

*Ædipus adpersus* Monatsberichte, Acad. Wiss. Berlin, 1863, 468. *Geotriton* do. Cope, Pr. A. N. Sci. Phil. 1865, 196.

*Habitat.* Near Bogota, New Grenada.

Interesting as the most southern of the American salamanders.

**ÆDIPUS RUFESCENS** Cope.

Sp. nov.

This species is near the *G. carbonarius*, but is notably more abbreviated, and has a different coloration. The vomerine series is shorter, and there is a lateral plica less.

Muzzle truncate with prominent subnasal projections; its length 1.5 line, the width between anterior canthus of eyes. Appressed limbs, separated by two and a half costal spaces. Plicæ eleven, with a twelfth indistinct axillary fold. Width of head 5.4 in length to groin. Tail short, thickened, cylindric, equal from end vent to shoulder.

The vomerine do not extend outside of the inner nares, and nearly meet. The paraspheonoids are as in other species, in two approximate patches, narrowing in front and but little divided behind.

*Color.* Sides and above black, the back and top of head with a rufous cast. Under surfaces brown, white specked.

	Inch.
Length to axilla.....	.39
“    groin .....	1.04
“    end tail .....	.92
“    fore limb.....	.26
“    hind “ .....	.26

From Vera Cruz, Mexico.

No. 6886, 1 specimen, Orizava, Mexico, F. Sumichrast.

The *Ædipus variegatus* Gray, Catal. Brit. Mus. p. 48, may belong to this genus, or even to one of the species here described—as the present one. It is described in the following language: “Yellow brown, with three irregular slightly inosculatory dorsal streaks.” Gray.

**SPELERPES**, Rafinesque.

Atlantic Journal, i, p. 22, 1832. *Cylindrosoma* Tschudi, Nat. Syst. Batrachier Neuchatel, 1838. *Cylindrosoma* et *Bolitoglossa*, pars Duméril Erp. Gen. ix. *Spelerpes* et *Pseudotriton* Baird, J. A. N. Sci. i; Hallowell l. c., iv. *Spelerpes* Gray, Catal. B. M. 1850, 43.

The tongue free, except at the glossohyal support. Palatine and parietal bones fully ossified; premaxillaries consolidated, and their spines embracing a fontanelle. Teeth small; toes 4—5. Pterygoid patches distinct from each other.

This is a natural genus, and is abundantly represented by individuals in the eastern district of the Nearctic Region, and the Mexican of the Neotropical. Its digital characters only distinguish it from *Manculus*, and some of the Mexican species approach that genus in the great reduction of the inner digit, which results from a diminution in the number of phalanges. The consolidation of the premaxillaries, a marked character, appears very early in the developmental history of such of the species as I have been able to study (*S. ruber*, *S. bilineatus*). The Mexican species pass their metamorphoses soonest, then such as *S. bilineatus*, and the *S. ruber* remains longest a larva.

I. Vomerine teeth not continued back to pterygoid patches; extended outwardly beyond nares.

a. Costal fold 11—12, tail cylindric, inner toes rudimental.

Plicæ 12; extremities of inner toes free, others short, thick, subequal; a canthus rostralis, muzzle truncate, vomerine series in contact; lead colored, usually with two dorsal series of red spots; largest.....*S. bellii*.

[May,

Plicæ 12; inner toe and joint distinct, other toes well developed, cylindric; width head 5 to 6 times head to axilla, 2.5 to 3 times to groin; tail generally more elongate; black, sides, tail, and often back, grey varied; larger.

S. leprosus.

Plicæ 11; inner toe not distinct, other toes very short, margined; width of head 4 2-5 to axilla, 1-3 to groin; tail short; black, unspotted; medium.

S. cephalicus.

II. Vomerine teeth not continued posteriorly to the pterygoid patches, nor exteriorly to beyond the nares.

a. Tail round, costal grooves 11—12, inner toes rudimental.

Plicæ 11 (without inguinal); width of head 4.5 length to axilla, 2.5-6 times in length to groin; tail rather short; upper lip more or less truncate and angulate.....S. chiopterus.

aa. Tail subround, costal grooves 21, inner toes minute.

Width of head near 1.7 length to axilla, .33 of length to groin; limbs short; tail thick at base; brown, dorsal region darker; small.

S. multiplicatus.

aaa. Tail compressed, costal grooves 13—14, inner toes longer.

Plicæ usually 14; width of head less than one-sixth to groin; head to axilla well over .33 of the same; body longer, tail not keeled above proximally, comparatively short, vomerine series turned obliquely backwards. Yellow, with two latero-dorsal black lines; tail dark laterally; belly immaculate; small.....S. bilineatus.

Plicæ 13; width of head equal one-sixth length to groin; muzzle to axilla more than one-third the same; tail long, keeled above. Yellow, sides many black spotted, a median dorsal series of spots; tail yellow, black barred; belly immaculate; large.....S. longicaudus.

Plicæ 13; width of head greater than one-sixth length to groin; from muzzle to axilla considerably more than .33 length to groin; tail long, keeled above. Yellow, with three black bands; tail black, yellow barred; belly mottled; large.....S. guttolineatus.

III. Vomerine series of teeth continuous posteriorly, with the pterygoid brushes, and originating behind nares.

Costal plicæ 15—16; head wide, not more than seven times to groin, not more than twice to axilla; no canthus rostralis; tail rounded at base, not finned; large; vermillion red, black or brown spotted.....S. ruber.

SPELERPES BELLII Gray.

Catalogue British Museum, p. 46. Cope, Proc. Acad. N. Sci. Phil. 1860, 372. *Edipus platydactylus* "Tsch." Baird, Journ. Acad. Nat. Sci. Phila. 1850, pp. 282, 286. *Bolitoglossa Mexicana* Duméril, Bibron Erp. Gen. ix, 93, 1854 (exclus. synonymy).

North Eastern Mexico.

SPELERPES LEPROSUS Cope.

Species nova.

This salamander is one of the numerous additions made to herpetology by Sumichrast's explorations in the mountains of Eastern Mexico. Of the seven species of Urodeles which he found in that region, this appears to be the third in size; it approaches in this respect, and in some degree in coloration, the *Plethodon glutinosus*.

The form is stout, the head broad with short muzzle, and the tail cylindric and glandular; it is not unfrequently swollen at the base. In the largest specimens, selected as the stoutest, the length of the head from the postorbital line is only 3.5 the width at the same point. The fore limb extended reaches to the posterior margin, or to the middle of the orbit, for in extreme speci-

1869.]

mens there is a difference in the degree of elongation of the body to the following amount: In the stouter, the length to axilla enters  $2\frac{3}{4}$  to groin; in the more slender  $2\frac{1}{2}$ ; in the former the width of head goes 5 times in length to groin; in the latter 6.25 times. There is no axillary costal fold; the inguinal is not marked; the plicæ do not extend on the back (where there is a faint median groove), but are distinct on the belly; tail annulate. The feet are very wide and the toes short, but not so much so as in *S. cephalicus*. The inner digit is developed on both feet, though short, especially the posterior; the outer is also larger than in the species just named. The toes are thickened at the extremities. The hind limb extends over 6.5 intercostal spaces from groin. The gular fold is well marked, while the longitudinal post-orbital groove is not or scarcely visible. The upper lip is slightly truncate, and with small subnasal angles.

The color is black as a ground, less obscured below, where it, however, varies to brown. The gular region splotched or speckled with gray.

The sides of the body with the tail are splotched lichen-like with light gray, the same sometimes covering the dorsal region. In one specimen there is a pale red dorsal band. Head black.

*Measurements.*

	Inches.
No. 6340, Type.	
Length from snout to gape.....	.18
"        "        axilla.....	.59
"        "        groin.....	1.75
"        "        end vent.....	2.
"        "        " tail.....	3.5
" forelimb .....	.42
" foot.....	.12
" hind limb.....	.433
" foot.....	.16
Width head.....	.3
" body at sacrum .....	.18

Like other Mexican *Spelerpes* this animal seems to pass its metamorphoses early; a young one sent with the adults measures 21 lines in length. The largest specimen measures 4.4 inches.

This species, according to Sumichrast, is confined to the Alpine region, in Vera Cruz, Mexico. In life, the light tints are of a pale yellow.

No. 6340, 6 specimens, Orizava, Mexico, Pr. Fr. Sumichrast.

*SPELERPES CEPHALICUS* Cope.

Proc. Acad. Nat. Sci. Phila. 1865, 196.

N. E. Mexico.

*SPELERPES CHIROPTERUS* Cope.

Proceed. Acad. Nat. Sci. Phila. 1863, p. 54. *Spelerpes orculus* Cope, Proc. A. N. S. 1865, 196, and 1866, p. 132.

N. E. Mexico.

*SPELERPES MULTIPLICATUS* Cope.

Species nova.

This small species resembles in general proportions *Hemidactylium scutatum*. It is well characterized in this genus by its numerous costal plicæ, and thickened, scarcely compressed tail.

The width of the head enters the length to the groin 6.75 times; the length to axilla enters thrice. The hind limb extended passes six intervals from the groin; the foot is wide, and the toes short, especially the inner and outer; the inner has but one minute joint free. The same may be said of the anterior digits. The tail is compressed a little, and considerably thickened; in

[May,

the smallest specimen the terminal .75 above and .33 below are keeled; in others the superior keel is more distal.

Upper lip moderately truncate, with infra-nareal angles, and in one, rudimentary cirri. The muzzle is rather thick and short, the head flat; in one smaller specimen the former is a little longer than in the others, and the width of the head relatively less. The vomerine teeth form short series, each rather suddenly bent backwards; the pterygoids two narrow patches, not approaching the vomerines, the relations in this respect being as in *S. bilineatus*.

The color in four specimens is an unspotted brown, the inferior surfaces paler, especially the gular region. In the smaller specimen above mentioned, which seems to constitute a variety, the brown color forms a broad dorsal band, with dark points; the sides are of a pinkish gray, and the under surfaces light yellow.

Measurements of the largest specimen, on the axis of the body:

	Inches.
Length from muzzle to orbit .....	.05
“ “ rictus .....	.12
“ “ axilla .....	.425
“ “ groin .....	1.53
“ “ end of tail .....	3.24
“ of fore limb .....	2.33
“ “ foot .....	.08
“ hind limb .....	.29
“ “ foot .....	.133
Width head at anterior angle orbits .....	.1
“ “ rictus .....	.22
“ body at sacrum .....	.15

The form of this species would indicate it to be terrestrial in its habits. Of its geographical range we have as yet little information.

No. 4038, 5 specimens, Red River, Arkansas, Dr. L. A. Edwards.

#### SPELERPES BILINEATUS Green.

*Salamandra bilineata* Green, J. A. N. S. i, 352, 1818; Holbrook, Herpetology, 1st ed. ii, 127, tab. 29—2d ed. v, 55, pl. 16, 1842. *Salamandra flavissima* Harlan, Sill. Journ. x, 286, 1826. *Spelerpes bilineata* Baird, Journ. A. N. S. i, 287; Gray, Catal. Brit. Mus. 44, 1850; Hallowell, Journ. A. N. Sci. (2) iv, 346. *Salamandra cirrigera* Green, Journ. A. N. Sci. iv, 253; Harlan, Med. Phys. Res. 99. *Spelerpes cirrigera* Baird, J. A. N. Sci. i, 287; Gray, Cat. B. M. 44; Hallowell l. c., iv, 347.

*Habitat*.—From Maine to Wisconsin, to Florida and Louisiana.

#### SPELERPES LONGICAUDUS Green.

*Sal. l.* (Sept. 1818) Green, J. A. N. S. i, 351; (1838) Hol. Herp. 1st ed. iii, 111, pl. 26; (1842) 2d ed. v, 61, pl. 19; (1842) Dekay, N. Y. Rept. 78, pl. 17, fig. 41.

*Spelerpes lucifuga* (1832) Raf., Atlantic Journal, No. 1, p. 22.

*Cylindrosoma longicauda* (1838) Tsch., Class. der Bat.

*Spelerpes longicauda* Baird, J. A. N. S. (2) i, 287; Hallowell l. c., 345; Gray l. c., 43.

*Habitat*.—Same as the last species.

#### SPELERPES GUTTOLINEATUS Holbrook.

*Salamandra guttolineata* Holbrook, Amer. Herpetol. 1st ed. ii, 61, t. 12—2d ed. v, 29, t. 7. *Spelerpes guttolineata* Baird l. c., 287; Gray l. c. 45; Hallowell l. c., 346.

*Habitat*.—South Carolina, Georgia. Alabama.

#### SPELERPES RUBER Daudin.

*Sal. rubra* (1803) Daud., Hist. Rept. viii, 227, pl. 97, f. 2; (1842) Holb. Herp. 2d ed. v, 35, pl. 9; (1842) Dekay, N. Y. Rept. 80, pl. 17, f. 43.

1869.]



*Sal. rubriventris* (Sept. 1818) Green, J. A. N. S. i, 353 (ad. living).

*Sal. maculata* (Sept. 1818) Green, J. A. N. S. i, 350 (bleached in spirits).

*Sal. subfusca* (Sept. 1818) Green, J. A. N. S. i, 351 (ad. in spirits?)

*Pseudotriton subfuscus* (1838) Tsch., Class.

*Myceioglossa ruber* Bibron fide Bon. Fauna Italica.

*Siren operculata* (1796) Pal de Beauv. Am. Phil. Trans. iv, 279, pl. —, f. 3 (larva).

*Proteus neocæsariensis* (Sept. 1818) Green, J. A. N. S. i, 358 (larva bleached in spirits).

*Pseudotriton ruber* Baird, Journ. A. N. Sci. Phil. i, 286; Hallowell l. c., 347.

*Spelerpes ruber* Gray, Cat. B. M. 1850, 45.

There are several varieties of this species, which, though quite distinct, pass into each other:

Var. *P. r. sticticeps* Baird, S. Carolina.

Var. *P. r. flavissimus* Hallowell; *Pseudotriton flavissimus* Hallowell, Proceed. A. N. Sci. Phil. 1850, 130, Georgia.

Var. *P. r. montanus* Baird; *Pseudotriton montanus* Baird, Journ. A. N. S. i, 287—293; Gray l. c., 46. The Allegheny Mountain region from Pennsylvania to S. Carolina.

*Habitat*.—The *Spelerpes ruber* is distributed over the Eastern district of North America from Maine to Minnesota, and to Texas and Florida.

#### GYRINOPHILUS Cope.

Tongue supported only by the glossohyal pedicel, boletoid; cranium fully ossified, the premaxillary bones remaining distinct, and embracing a fontanelle. Digits entirely distinct, 4—5.

This genus is now first distinguished from *Spelerpes*, on account of the marked peculiarity of the premaxillary bone, in which it resembles *Plethodon* rather than the first named. But one species is as yet known. It has a superficial resemblance to the *Spelerpes ruber*, but differs in several osteological peculiarities. Its nasal bones are well separated, and the proötic squamosal crests are peculiar. The anterior or proötic crest is short, distinct and curved inwards and backwards; that on the proximal extremity of the squamosal curves towards it, but leaves a considerable interspace. This is occupied by two osseous processes like two teeth of a comb. In *S. ruber* the anterior crest only is present, and forms a rectangle, the anterior limb being transverse, and the angle inwards. The nasal bones also are in contact across the premaxillary spines.

The type of the genus remains for a more than usually long period in the larval condition, and just before its metamorphosis is quite identical in its osteological characters with the genus *Necturus*.

Costal plicæ 1; head wide, width less than seven times to groin, not over twice to axilla; a strong canthus rostralis; tail rounded at the base, not finned; large; uniform purple-gray above.....*G. porphyriticus*.

#### GYRINOPHILUS PORPHYRITICUS Green.

*Salamandra porphyritica* Green, Cont. Mac. Lyc. 1827, vol. i, pl. 1, fig. 2.

Holbrook, N. Am. Herpet. 2 ed, v, 83, pl. 28.

*Sal. salmonea*, (1838), Storer in Hol. Herp. 1st ed. iii, pl. 22. (1842) Hol. Herp. 2d ed. v, 33, pl. 8. (1840) Storer, Mass. Rep. 248. Dekay N. Y. Rept. 76, pl. 16, f. 39. *Pseudotriton salmoneus* Baird, J. A. N. Sci. i, 287. Hallowell l. c. iv, 347. *Spelerpes salmoneus* Gray, Catal. B. M. 1850—46. Cope, Journ. A. N. Sci. Phil. 1856, 99. *Sp. porphyriticus* Gray, l. c.

There can be little doubt that, as Baird has suggested, this is the *Salamandra porphyritica* of Green. The angulation and pale color of the canthus rostralis is described accurately, as well as the color. The large larva, four inches long, is only referable to this species. The *Amblystoma microstomum*, which Holbrook and Hallowell have imagined to be Green's species,

[May,

is not indicated by Green's description. It is not so large, has not the canthus rostralis, the larva is very small, and the coloration is quite different. Green's figure represents it well, though the *Amblystoma jeffersonianum*, on the same plate, is represented as larger, a relation of size, the reverse of what usually holds in nature.

This is the only one of our eastern Salamanders which attempts self defence. It snaps fiercely but harmlessly, and throws its body into contortions *in terrorem*. It prefers the coolest localities throughout the Alleghany Mountain region from New York to Alabama. It is aquatic, but prefers the still waters of swamps or springs to running streams. It is common in the region whence Green procured it, while *A. microstomum* is rare if existing at all.

#### ANAIDES Baird.

Iconographic Encyclopædia, ii, 1849, 256. Girard, United States Expl. Exped. Herpetology p. 8, tab. i, f. 18—25.

Tongue attached from glossohyal to anterior margin, on the median line; considerably free. One premaxillary bone. Pterygoid teeth on a single plate. Vomerine teeth on a ridge which is continuous between the interior nares. Maxillary teeth\* longer on the anterior than posterior part of the arch, compressed, knife-shaped, with entire enamel; mandibular teeth of similar form and large development, few in number, and confined to the anterior half of the ramus. Toes 4—5, obtuse and slightly dilated at tip.

This curious genus is furnished with by far the most powerful dentition of any existing Salamander, and resembles in this respect the genera of the coal measures, *Brachyectes*, *Hylarpeton* and *Hylonomus*. In other points there is little difference between it and *Plethodon*. One marked feature brings it nearer *Desmognathus* than any other genus of *Plethodontidæ*. The *Opisthotics* are each furnished with a high longitudinal crest over which the temporal muscle passes from its origin on the atlas. It has, however, the usual origin from the median line of the parietals, which scarcely exists in *Desmognathus*. This line is marked in *A. lugubris* by an elevated crest. The end of the muzzle in that species bears evidence to a habit similar to that which accompanies the singular structures of *Desmognathus*, viz., that of burrowing or rooting among stones or other resisting objects. The derm is similarly adherent to the bone, and the latter is exostosed and rugous. The prefrontal bones are well developed.

No species has yet been found east of the Californian or Pacific Coast region.

Large, stout; thumb developed, fingers short; pterygoid series narrow, vomerines strongly curved backwards; width of head 4.5 to groin; light brown above, with yellow spots..... *A. lugubris*.

Smaller, slender; thumb not distinct, fingers long, slender; pterygoid series wider, vomerine series scarcely recurved; width of head 6.33 times in length to groin..... *A. ferreus*.

#### ANAIDES LUGUBRIS Hallow.

*Salamandra lugubris* Hallow., Proceed. Acad. Nat. Sci. Phila. iv, 1848, 126. *Anaides lugubris*, Baird, Iconogr. Encycl. ii, (1st ed.), 1849, 256; B. and G. in Proc. Acad. Nat. Sci. Philada. vi, 1853, 302. *Taricha lugubris* Gray, Catal. Amph. Brit. Mus. Parts ii, 1850, 26.

*Habitat*.—California from Ft. Tejon to Oregon.

#### ANAIDES FERREUS Cope.

Spec. Nov.

This is a smaller and more slender species than the last, not being very

\* Girard l. c. describes the teeth as not fixed to the jaw, and capable "of a depression backwards." This is only true of successional teeth, or teeth about to be shed; the functional teeth are firmly anchylosed.

different in proportions from *Plethodon intermedius*, but with a broader and more flattened head.

The head is an elongate oval, slightly truncate in front; the nostrils are antero-lateral, and with a delicate groove connecting with the commissure of the mouth. Canthus rostralis not marked. The muzzle is as long as the fissure of the eye, while the length of the commissure of the mouth (diagonal line) is equal to the width of the head at the rictus. The tongue is largely free, the posterior portion rather narrowly. The inner nares are nearer together than the outer. The vomerine teeth commence behind the nares and form a single series of eight on a ridge, which is gently arched backwards on the median line. The parasphenoid patch does not extend quite forwards to the middle of the orbits; it is much flatter and wider anteriorly than in *A. lugubris*, and contains opposite the posterior margin of the orbits ten longitudinal series of teeth, those of adjacent rows alternating.

Gular fold well marked; costal folds fourteen, not continued on back or abdomen. The limbs, and especially the digits, are slender; appressed to the side they fail to meet by the length of the fingers. The form of the body is slender and cylindric, and the width of the head enters the total length of the groin seven times. The tail is as in *A. lugubris*, equal to the head and body in length, cylindrical, slender, and slightly compressed at tip.

The thumb possesses a short phalange, but no part of it is free as in *A. lugubris*; on the other hand, all the phalanges of the other toes of both feet are more slender than the *A. lugubris*, and the distal ones distinctly truncate and slightly emarginate, with dermal thickening below tip. All are quite free. Number of phalanges 1—2—3—2, 1—2—3—3—2.

*Coloration*.—Sides and nape greenish gray; top of head and dorsal region behind in the form of a serrate band, with the tail black; below yellowish brown. Limbs black above, brown below. Inferior regions unspotted.

#### Measurements.

	Inch.
Length (axial) from snout to rictus oris.....	.42
“ “ “ axilla .....	.70
“ “ “ groin.....	1.75
“ “ “ end vent.....	2
“ “ “ end tail.....	3.65
“ fore limb.....	.5
“ foot .....	.2
“ hind limb.....	.55
“ foot .....	.26
Width “ “ (sole) .....	.11
“ head at rictus oris.....	.28
“ body at middle.....	.24
“ “ sacrum .....	.2

The maxillary bone displays the same sudden decurvature anterior to and below the orbit which the *A. lugubris* does, but it is less marked; in consequence the commissure of the mouth is less sinuate. The long mandibular and maxillary teeth, while of similar structure, are less developed; perhaps larger specimens of this species may be found where they may be larger, as in small specimens of *A. lugubris*, they are nearly similar in proportions.

Though nearly allied to the *A. lugubris*, the present species will never be confounded with it. It is a much weaker form, and does not display the characters of the genus in so striking a degree. But one specimen has come under my observation, as follows:

No. 6794; one specimen; Fort Umpqua, Oregon, Dr. Vollen.

#### THORIIDÆ.

Palatines not prolonged over parasphenoid bone; no postorbital arch.

[May,

Vertebral opisthocœlian.  
 Carpus and tarsus osseous.  
 Dentigerous plates on the parasphenoid.

This family combines the peculiarities of the *Desmognathidæ*, *Plethodontidæ* and *Amblystomidæ* in a remarkable manner. The well developed opisthocœlian vertebræ are characteristic of the first named and of the *Salamandridæ*, the fully ossified tarsus and carpus of the *Amblystomidæ*. The dentition is entirely that of the *Plethodontidæ*. This was the less to have been anticipated, as the general characters of the only genus are those of the genus *Spelerpes*. The history of the metamorphosis is as yet unknown. The only known genus is Mexican.

#### THORIUS Cope.

Parietal and palatine bones rudimental, represented by cartilage and membrane. Posterior nares therefore not separated from orbit; sphenoidal patches of teeth entirely united; tongue boletoid, free in front. Toes distinct, rudimental, 4—5.

The tarsal bones consist of astragalus, calcaneum, a scaphoid and three minute cuneiform bones. The metatarsals and phalanges are fully ossified, as are the corresponding elements of the fore limbs.

This genus is highly interesting, as indicating the lowest grade of ossific deposit found among the tailed Batrachians, accompanied by characters of full development in other respects. Thus, while the cranium is but imperfectly ossified, and less developed than in a comparatively early larval stage of *Amblystoma*, the tongue, vertebral column, and extremities have advanced far beyond its larval condition, which is permanent in the latter genus, and the branchial apparatus disappears while the individuals are but little more than half their adult size.

It is represented as yet by but one species, from Mexico, of terrestrial habits.

#### THORIUS PENNATULUS Cope.

American Naturalist, 1869, 222.

This is a small species, with smooth skin, very weak limbs, and stout tail. The head is scarcely wider than the neck; it is not flattened, the loreal region is rather elevated and distinct, and the muzzle slightly prominent. The upper lip is sometimes truncate, with infranarial angle prominent, sometimes regularly rounded. The nostril is larger than any known salamander, its diameter equalling half that of the pupil.

The vomerine teeth are situated on a transverse, elevated crest, which is a little behind between the inner nares, and though curved backwards, is but little interrupted medially. Each half contains four teeth, perhaps five when complete. The sphenoidal series is large, pyriform, the anterior extremity narrowed and prolonged to opposite the middle of the orbits.

There are thirteen costal folds; three and one-half of their interspaces are covered by the extended hind limb, from its origin. The toes are very small; only the three median behind and three outer before are developed beyond the metatarsus. The phalanges are, anteriorly 0—2—2—1; posteriorly 0—2—2—2—0. Their extremities are distally free; that of the median posterior projects more beyond those adjacent than in *O. lineolus*. The costal plicæ are not marked on the dorsal, and only on the ventral in the color variety mentioned. The tail is stout, and for a short distance at the base subquadrate in section, and nearly as thick as the body; distally it is more compressed, but is not keeled; length equal to that of head and body. The width of the head enters 6.5 times, and the length in front of the axillæ 3.33 times the length to the groin.

The color is brown, yellowish and clouded below, the dorsal region covered with a gray band, which extends to the end of the tail. This band is particularly light and slightly metallic on its margins, which are undulate or serrate, 1869.]

and which are in strong contrast to the black of the lateral regions. The latter graduates into the brown of the belly. The gray dorsal band is marked by a number of short divergent spots, which are in pairs and open backwards, V-shaped, one to each costal interval. One specimen constitutes a color variety, as I find no other points of peculiarity. It differs in being nearly black above, in having the sides longitudinally streaked, and the gular region specked with white; a whitish incomplete triangle on the front and muzzle.

*Measurements (axial).*

No. 6341. Type ♀

	Inches.
Length from snout to rictus oris .....	·11
“ “ axilla .....	·3
“ “ groin .....	·866
“ “ end vent .....	1·016
“ “ “ tail .....	1·95
Width head behind .....	·133
“ body at sacrum .....	·133
Length fore limb .....	·14
“ hind “ .....	·17
“ “ foot .....	·05

The specimen measured is the largest; it contained numerous eggs in the oviducts, which have attained a diameter of a line, without indication of embryo. This size is remarkable when compared with that in the *Pleurodelidæ*, and other salamanders. As the body is little above six lines in length, the number discharged at any one time must be small. The smallest specimen measures ·6 inch from muzzle to groin, so that it appears that this species passes its metamorphosis quite early. F. Sumichrast, to whom we are indebted for this species, says of it:

No. 6341, 6 specimens, Orizava, Mexico, F. Sumichrast (No. 48).

No. 6744, 1 specimen, “ “ “ Color var.

*DESMOGNATHIDÆ.*

Cope, Journ. Acad. Nat. Sci. Phila. 1866, 107.

Prefrontals and pterygoids wanting.

Parietals not embracing frontals.

Orbitosphenoid separated by membrane from proötic.

Vestibule, internal wall osseous.

Dentigerous plates on the parasphenoid.

Carpus and tarsus cartilaginous.

Vertebræ opisthocælian.

The peculiarity of the vertebræ chiefly distinguishes this family from the *Plethodontidæ*. In the only genus which represents it there are numerous peculiarities, which are not found elsewhere. Should other genera be found which do not possess them, the above diagnosis would probably be the proper test of their family affinities.

The distribution is confined to the eastern district of the nearctic fauna so far as yet known.

*DESMOGNATHUS* Baird,

Journ. Acad. Nat. Sci. i, 282, 285. Gray, Catal. Brit. Mus. 1850, 40.

Premaxillaries united, embracing a fontanelle; parietal bones ossified. Occipital condyles on cylindric pedestals. Temporal arising only from the atlas, with a tendinous external margin and insertion; passing freely over the parietal and proötic bones. Tongue attached, except by its lateral and posterior margins. Vomerine and sphenoidal teeth present. Digits distinct, 4—5.

The absence of o. prefrontale does not appear to be the result of its conflu-

[May,

ence at any late period, with the nasale; its ordinary position is traversed by the frontal suture. The frontal bone is decurved, and closes the preorbital aspect of the superpalatal vacuity, usually open.

This marked genus, so abundantly represented by individuals in the eastern district of North America, is not admitted by either Duméril or Hallowell, probably because it does not differ in external characters from *Plethodon*. It is an excellent illustration of the error of adhering to external characters only, in the explanations of the relations and affinities of organized beings, except for a limited range. The examination of the skeleton of species of this genus utterly changes the impressions produced by a consideration of the external characters. It may be stated as characteristic of the *Batrachia* in general, that their affinities cannot be determined without study of the skeleton.\*

There are no dermal appendages developed in this genus at the breeding season.

I. Males with posterior half mandible concave and edentulous.

Inferior lateral series of pores imperfect or wanting, superior none; no tubercle in canthus oculi. Tail rounded. Fourteen costal plicæ. A yellowish dorsal band; belly immaculate. Size small..... *D. ochrophæa*.

II. Males with mandibular alveolar margin continuous and completely toothed.

Inferior lateral series of pores well developed, superior irregular or wanting; a tubercle in canthus oculi; tail compressed, and keeled; fourteen costal plicæ. Above dark spotted, below marbled. Size medium.

*D. fusca*.

Two well developed lateral series of pores, a marked tubercle in the canthus of the eye; tail flattened, finned above, attenuate; twelve costal folds. Black above and below. Size large..... *D. nigra*.

*DESMOGNATHUS OCHROPHÆA* Cope.

Proceed. Acad. Nat. Sci. Phila. 1859, 122.

This small species bears a strong resemblance to the *Spelerpes bilineatus* Green, and apart from generic characters, may be known from it by the rounded tail, the paler colored abdomen, and the light bar from the eye to angle of the mouth. Its proportions are stouter than in *Plethodon erythronotus*, to which it also bears some resemblance.

The costal folds are thirteen, but fourteen, if that which is immediately above the groin be counted. The first falls immediately into the axilla. This is the characteristic arrangement in *D. fusca* also, while in *D. nigra* the fold above the groin usually extends to it, and is the twelfth, while that which corresponds to the first of the species before named falls just in advance of the axilla. Though this is typical of *D. nigra*, occasionally another plica appears above the groin, and the twelfth is slightly in front of it.

The pores in *D. ochrophæa* are very difficult to observe; in a few specimens I have seen a few of those of the lower series, the upper I believe to be wanting. The gular fold is distinct, and another vertical fold commences behind its extremity, and turning longitudinally extends more or less distinctly to the orbit. As in other species the derm adheres closely to the frontal bones and is more or less rugulose. The head is oval with rounded depressed muzzle; its greatest width enters the length to the groin  $5\frac{2}{3}$  times. The commissure of the mouth is slightly flexuose.

The appressed limbs fail to meet by four intercostal spaces. The inner digits of both feet are short, but free; longer than in *Plethodon* species of similar size; the other digits are also longer and more distinct; proportions, 1—4—2

\* The skeletons on which the present observations are based are in large part the preparations of Prof. Baird.

—3; 1—5—2—4—3; only three phalanges in longest toes. The tail is quite slender, and only compressed at the tip; in some there is a keel above on the distal third, but never any dermal fin.

The vomerine teeth are very few and small when present; they are often wanting. Their basal line is on a ridge which is convex backwards, nearly continuous medially. The parasphenoid teeth stand on two narrow plates which are well separated, especially behind, and are shortened; anteriorly they only reach to near the middle of the orbits. The mandibular teeth present peculiarities in the male, by which it may be readily distinguished from the female. In a large number of specimens the oral commissure is but little undulate, and the mandibular teeth, though longer medially, are continued to near the basis of the coronoid process. The males exhibit a strongly flexuous commissure, and the alveolar margin of the mandible is deeply concave below the front of the orbit, and edentulous. The distal portion is abruptly convex and armed with long teeth. The margin is slightly concave anterior to this point, and finally rises again at the symphysis, which is prominent and protected externally by a pad of crypts as in *D. fusca*. The structure of the males is in the mandibular dentition quite that of the genus *Anaides*, the *A. ferreus* m. presenting the characters but little more strongly. No such sexual difference can be found in the *D. fusca*, though the commissure only may be sometimes more flexuous in males. The jaws and dentition in the *D. nigra* do not differ in the two sexes. I have observed that two of the many males of *D. ochrophæa*, possess the female dentition. The tongue in *D. ochrophæa* is an elongate oval, considerably free behind.

The color of the females is a bright brownish yellow, fading to a dirty white below, with a dark brown shade on each side from the eye to the end of the tail which is darkest above, and gives the dorsal hue the character of a band. There is an irregular series of brown dots along the vertebral line. Males are rather longer and usually darker in color; thus the dorsal band is brownish, the lateral bands blackish, and the dorsal spots more distinct. In most specimens of both sexes there is a light band from the eye to the rictus oris, and the belly is always immaculate, the gular region nearly always. The testes and vas deferens are covered with black pigment; no pigment on the peritonæum of the female.

This species scarcely attains half the size of the *D. fusca*, as indicated by the numerous females with developed eggs in our collections. As the eggs are equal in size to those of *D. fusca* when ready to be discharged, and as the species is only half the size of the same, the eggs in the oviduct of a gravid female at one time are only half as numerous. I have only found from 6—10 in *D. ochrophæa*, in each oviduct, while from 18 to 30 may be counted on one side in *D. fusca*.

#### Measurements.

	Inches.
Length (axial) from snout to rictus oris.....	.2
“ “ “ axilla.....	.46
“ “ “ groin.....	1.29
“ “ “ end vent.....	1.51
“ “ “ end tail.....	3.01
“ fore limb.....	.3
“ foot.....	.08
“ hind limb.....	.36
“ foot.....	.17
Width “ “ sole.....	.8
“ head at rictus oris.....	.2
“ body at middle.....	.22

*Habitat, etc.*—This Salamander is chiefly abundant in the chain of the Alleghenies and their outlying spurs; I have never seen it in the hill country of

[May,

Pennsylvania, or the lower plains of New Jersey and Maryland. Nor have I observed it in the Alleghenies of south-western Virginia; the most southern locality yet known is the Broad Top Mountain in Southern Pennsylvania, from which the Academy possesses numerous specimens from Dr. Leidy. In northern Pennsylvania and the Adirondack it is very abundant. The Academy has numerous specimens from Warren county, Penn., from Dr. Randall.

The habits of this animal are terrestrial. It occurs under the bark of every fallen log of hemlock (*Abies canadensis*), and in the debris of the dark damp forests of the north. I never saw one in the water of streams and runs, the habitat of the other species of the genus.

Prof. Baird was familiar with this species before I described it. I published his suggestions expressed in a letter, that it was the *S. haldemani* of Holbrook. Holbrook's figure does not represent this species in any degree, nor is his description more conclusive as to the reference of this species to it rather than some others. He says it is marked with spots on the upper surfaces, which are "disposed without much regularity," but the largest are on the flanks. There are but few spots above in this animal, and they are in a regular series. The sides are banded.

No. 3917, 10 specimens, Alleghany Co., N. Y., Dr. Stevens.

No. 4041, 3 specimens, Bradford Co., Pa., C. C. Martin.

20 specimens, Meadville, Pa., Prof. Williams.

No. 4539, 5 specimens, Susquehanna Co., Pa., Prof. Cope.

*Variety*.—A specimen with the dentition, coloration and proportions of body and tail of this species was sent to the Smithsonian Inst., from Georgia, by Dr. Jones. It approaches the *D. fusca* in having a small *tuberculum canthus oculi*, and a well developed inferior series of mucous pores.

DESMOGNATHUS FUSCA, Rafinesque.

*Triturus*, (March 1, 1820), Raf. Annals of Nature. *Sal. intermixta*, (Aug., 1825), Green, Hall's Portfolio, Vol. 20, p. 159. (Jan. 1827), Green, Cont. Mac. Lyc. No. 1, vol. 1. *Sal. picta*, (Nov. 1823), Harlan. J. A. N. S. v. 136. (1840), Storer, Mass. Rept. 251. *Sal. quadramatulata*, (1842), Hol. Herp. 2d. ed. v. 49, pl. 13.

This, perhaps the most abundant Salamander in North America, is quite variable in coloration, but not in proportions and structural peculiarities. Those of the latter which characterize it are the presence of fourteen costal plicæ; one well, and one little developed lateral series of mucous pores; the equal and regular distribution of teeth in the mandible of males; the compressed tail, keeled above, and finned distally; the presence of a tubercle in the anterior canthus of the eye; the marbled color of the belly. In many quarts of specimens I find four specimens from southern localities—two in Academy from Charleston, two in Smithsonian from Biloxi, Miss., which have fifteen plicæ, but one of the latter has fourteen on one side. In specimens which have been preserved in too strong spirits the pores are rendered invisible; the same occurs when the spirit is impure or weak. In soft specimens the canthal tubercle sometimes disappears, and in many young specimens and some adult females it does not appear to exist.

The head is more depressed and the muzzle prolonged than in species of the other genera. The eyes are prominent; the plicæ behind them strongly marked. These consist of one on each side the head and nape, which converge posteriorly and then turn abruptly outwards to be continued into the gular plica. A second plica extends from the mandible across the rictus oris to the upper plica. A second longitudinal plica extends from this to the gular enclosing an ovate enlarged area; and a short one to the orbit encloses a post-orbital subround and smaller area.

The commissure of the mouth is more undulate in males than in females, but both present a slight elongation of the symphysis produced externally by  
1869.]



a pad of crypts. The width of the head enters the length 5.66 times. The vomerine teeth are often wanting, and when present, minute and few. Their basis is a ridge which extends from behind the middle of the posterior nares, across the palate with a posterior convexity. The parasphenoid patches are small and not in contact; they do not extend to opposite the middle of the orbits.

The median toes are elongate and as in *D. ochrophæa*; they fail to meet by four interspaces when pressed to the side. The tail has a characteristic form, which is invariable at all periods; near the base the section is trigonal; the dorsal keel increases in elevation, and becomes a narrow fin posteriorly; the extremity is attenuated. Its length is just equal to that of the remainder of the animal.

There are two color varieties which blend together so as to indicate that no higher value can be attached to them; one of these is the *Salamandra auriculata* of Holbrook.

Above brown with gray and pink shades; sides and belly marbled, the pale predominating; no red spots on sides..... var. *fusca*.

Above and sides black; the latter with a series of small red spots; a red spot from eye to canthus of mouth present or absent; belly marbled, the dark predominating..... var. *auriculata*.

The latter variety occurs only in the Southern States; the tubercle of the angle of the eye and the upper lateral pores are often better developed in it than in var. *fusca*, therefore approaching *D. nigra*. It is, however, easily distinguished from the latter.

Sundry specimens lack the red spots, and others have paler bellies, resembling thus the darker *fusci*. The size is the same.

In the young of *D. fusca* there is a series of pinkish incompletely separated alternating spots, in two series, covering the whole dorsal region; they are rarely so well distinguished or so bright as in the specimen of the same which furnished the type of Holbrook's *S. quadrimaculata*. The pink fades to orange brown or ochre, and to pale brown with age, and at the fullest maturity all are lost in a uniform blackish.

*Measurements. No. 6832.*

	Inches.
Length (axial) from snout to rectus oris.....	.3
“ “ “ axilla.....	.71
“ “ “ groin.....	1.95
“ “ “ end vent.....	2.3
“ “ “ tail.....	4.6
“ fore limb.....	.42
“ “ foot.....	.15
“ hind limb.....	.62
“ “ foot.....	.26
Width sole do. ....	.16
“ head at rectus oris.....	.375
“ body at middle.....	.55

*Habitat, etc.*—This species lives chiefly among the stones in the many shallow rivulets and springs of the hilly and mountainous regions of the country. It is not so partial to deeper and stiller waters as the *Spelerpes ruber*, but prefers the rapid and shallow streamlets; here it may be found under every stone, or its delicate larva may be observed darting rapidly from place to place, seeking concealment among mud and leaves. The *D. fusca* is one of the most active and vigorous of our species. The peculiar structure of the temporal muscle and its tendon, and of the occipital condyles, with the strength of the bones of the front, enable it to burrow among stones and in earth more readily than the species of other genera. When pursued it runs

[May,

and wriggles out of sight with the greatest rapidity, and is quickly concealed by assistance of its dusky colors.

Prof. Baird originally noticed the curious disposition of the eggs in this species, which I have verified on a few occasions. As in the *Anurous* genus *Alytes*, the eggs on emission are connected by an albuminous thread, which soon contracts and hardens. One of the sexes protects this rosary by wrapping it several times round the body, and remaining concealed in a comparatively dry spot. How long this guard continues is not known.

The most eastern specimen I have seen is from Essex Co., Mass. Besides a great number of specimens in the Museum of the Academy, the following form the Smithsonian basis of the examination.

No. 3678,	2 specimens,	Summerville, S. Ca., ?
" 3769,	3 "	Philadelphia, Pa., J. Richard.
" 3880,	8 "	Anderson, S. Ca., Miss Paine.
" 3876,	2 "	Summerville, N. Ca., J. McNair.
" 3883,	25 "	Meadville, Pa., Prof. Williams.
" 3882,	5 "	Orange, N. J., ?
" 3896,	10 "	Columbus, Ohio, Leo Lesquereaux.
" 3892,	3 "	Clark Co., Va., Dr. Kennerly.
" 3893,	8 "	Pittsburg, Pa., S. F. Baird.
" 3891,	7 "	Mississippi, B. L. C. Wailes.
" 3904,	15 "	Abbeville, S. Ca., J. B. Barratt, M.D.
" 3919,	1 "	Salem, N. Ca., J. Lineback,
" 3909,	9 "	" " "
" 3914,	6 "	Highland Co., Ohio, ?
" 3910,	4 "	Knoxville, Tenn., Prof. J. B. Mitchell.
" 3912,	1 "	Adirondack, N. Y., R. Clark.
" 3905,	1 "	Columbia, Co., Pa., Dr. Henderson.
" 3925,	3 "	Gloucester Va., ?
" 3708,	5 "	Eutaw, Ala., ?
" 3921,	1 "	Dayton, Ala., Edgeworth.
" 4718,	2 "	Georgia, Dr. Jones.
" 4843,	1 "	Brookville, Ind., Dr. R. Raymond.
" 5039,	1 "	Georgia, Dr. Jones.
" 3901,	10 "	Riceboro, Ga., Dr. Jones, <i>var. auriculata</i> .
" 4717,	2 "	Georgia, " " " "
" 6830,	5 "	Georgia, ? " "
" 6831,	2 "	Biloxi, Miss., C. Billman, <i>var. fusc.</i>
" 6832,	4 "	Georgia, Dr. Jones, " "

#### DESMOGNATHUS NIGRA, Green.

*Sal. n.*, (Sept. 1818), Green, J. A. N. S. i. 352. *Triton n.*, (1842), Holb. Herp. V. 81, Ph. 27. *Desmognathus nigra*, Baird, Journ. A. N. Sci. i, p. Gray, Catal. Brit. Mus. 1850, p. *Plethodon niger*, pars, Hallowell, J. A. N. Sci. Phil. 1858, p. 344.

This is the most robust Salamander of the eastern regions of our Zoologica district; it is not so slender as the *Gyrinophilus porphyriticus*, but a much stronger animal. As compared with the *D. fusca*, it is much larger, the tail is more compressed and extensively finned, and the color is uniformly different. Besides the characters already pointed out in the table, it differs from *D. fusca*, as follows. The parasphenoid patches of teeth are prolonged more anteriorly, and approach very near the vomerines in most instances; they are always prolonged beyond the middle of the orbits; their prolongation is at the same time narrowed, and in most, the patches are not distinguished at this point. The vomerine series are better distinguished (though not always) being oblique, separate, and not extending beyond nares. The tongue

1869.]

is, in eight specimens examined, nearly round, while it is always a long oval in the two other *Desmognathi*; finally the only male does not possess the black pigment coat of the testes, always present in the others, though as in them the vas deferens is black. The body is stouter, and the width of the head enters the length to the groin less than five times; in the others always more; this is also expressed by the existence of only twelve costal plicæ, and the fact that the appressed limbs are only separated by  $2\frac{1}{2}$  intercostal spaces.

The postorbital plicæ are not strongly marked. The mucous pores are well developed, and the two lateral series are often distinct in alcoholic specimens by their white color; when they become dry they are difficult to observe. There are two rather distinct gular series within the mandibular rami on each side, and one on each side extending inwards and forwards from the gular plica. The superior lateral series extends from the orbit to near the end of the tail; the inferior turn round the humeri to each side the pectoral region.

The proportions of the fingers are as in *D. fusca*; they are entirely free. The eyes are prominent, with thick, opaque palpebræ. A tubercle occupies the anterior angle, which, after an examination of that in *D. fusca*, is a dismemberment of the superior eyelid.

The coloration is uniform in about twenty specimens examined. It is simple, viz., uniform black above and below, except the muzzle from between the eyes, the lower jaw, the end of the tail and the soles of the feet, which are brown.

*Measurements of 3923.*

	Inches.
Length (axial) from end muzzle to orbit.....	.29
“ “ “ canthus oris.....	.55
“ “ “ axilla.....	1.22
“ “ “ groin.....	3.23
“ “ “ end vent.....	3.76
“ “ “ tail.....	6.96
“ of fore limb.....	.69
“ “ foot.....	.26
“ of hind limb.....	1.02
“ “ foot.....	.47
Width “ “ (sole).....	.27
“ between eyes in front.....	.3
“ at canthus oris.....	.65
“ of body.....	.75
“ “ at sacrum.....	.54

*Habits, etc.*—This creature is aquatic; but after the fashion of the *D. fusca* it occurs only in shallow stony brooks. It is, so far as known, confined to the Alleghany Mountain ranges from Pennsylvania southwards. It is abundant in the streams of the rocky ravines and cold springs in the remotest depths of the forest, where its retreat is cool and dark. It seeks concealment under loose stones and slabs of slate with great activity, and is not easily caught. Its habitat does not seem to be shared by any species but the *D. fusca*; the *Gyrinophilus porphyriticus*, the other characteristic Alleghany species, haunting standing springs and bogs where stones are not so numerous. Green described it from Pennsylvania, but Baird who is familiar with the Alleghany fauna of our State, says he has not observed it near Carlisle. Nor have I met with it north of Virginia, where it is common. Besides Green's type, and specimens from near the Kanawha River in S. W. Virginia, in the Academy of Mus.; the Smithsonian contains the following;

No. 3886, 2 specimens, Georgia, Dr. Jones.  
 “ 3923, 4 “ Abbeville, S. Ca., ? ?  
 2 “ Giles Co., Va., E. D. Cope.

[May,